



Rudolph P. Darken

Assistant Professor

(408) 656-4072

darken@cs.nps.navy.mil

Research Areas

Human factors of virtual environments; human-computer interaction; training systems; wireless mobile computing, wearable computing.

Research Descriptions

While virtual environments (VE) are gaining widespread notoriety as a training tool and general interface to information spaces, little research has been done to show that this technology is in fact useful for training or that it represents an improved interface over conventional techniques. Our tendency to embrace technology before it proves itself useful is most evident here, with years of research and development and millions of dollars spent in the name of “training”, we have precious little to show for our efforts and research dollars.

One of the fundamental obstacles involved with large information spaces and most VE simulators is that of user disorientation. Users cannot navigate a virtual space as well as they can a real space. My interests in this problem come from two different perspectives; (1) navigation aids to improve users’ performance on navigation tasks in VEs, and (2) navigation training aids to improve users’ performance on real world navigation tasks trained in the VE.

Another aspect of this problem has to do with locomotion techniques available to users. Currently, there is no way for a user to walk naturally in a large VE. There are encumbering cables and limited space in which the user must operate. We have recently evaluated a device (the Omni-Directional Treadmill) that attempts to overcome this limitation.

It has recently been shown that we receive more information aurally than we are consciously aware of. In fact, it is believed that sound has a large impact on training effectiveness in VEs. We are beginning a research program to investigate this issue within the context of air training.

In this, “the information age”, it is somewhat surprising that we allow ourselves to be chained to a desk, staring at a

monitor and typing on a keyboard. I believe usability in computing is not just a matter of *how* we do things with computers but *where* we do things with computers. The objective here is to develop a wireless mobile computing environment where information is *where* users need it *when* they need it. There is a strong overlap between this and VE research as what we learn about usable interfaces to virtual spaces can be applied to building usable interfaces to real spaces such as ship compartments, buildings, towns, and the battlefield.

Relevance to DoN/DoD

The navigation training project is sponsored by the Office of Naval Research and is being targeted as a near-term training tool for special operations forces and Marines. The spatial sound in aviation training is sponsored by the Naval Air Command (PMA-205-6B) and will integrate an acoustic renderer with the TOPSCENE mission rehearsal system at NAWC-TSD. By focusing on relevant DoD problem areas such as these rather than theoretical laboratory scenarios, the strengths and limitations of this technology can be better understood and brought to bear on real world problems.

Recent Publications

Darken, R.P., & Sibert, J.L. (1996). *Navigating Large Virtual Spaces*. The International Journal of Human-Computer Interaction, 8(1), pp. 49-72.

Darken, R.P., & Sibert, J.L. (1996). *Wayfinding Strategies and Behaviors in Large Virtual Worlds*. Proceedings of ACM SIGCHI 96, pp. 142-149. (See also CHI 96 Conference video).

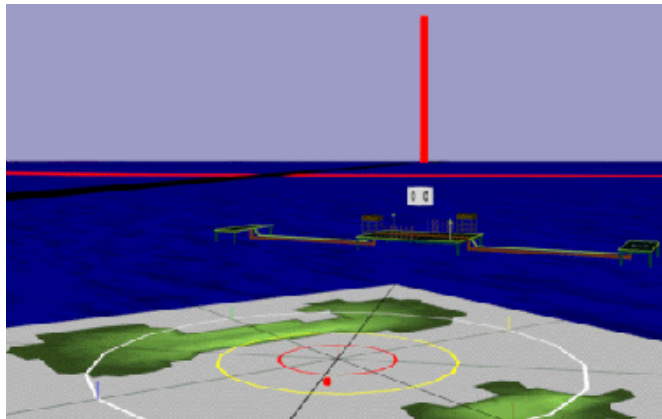
Darken, R.P., Hill, T.A., Solan, B.T., & Brookes, C.B. (1996). *A Hybrid Virtual Environment Interface to Electronic Warfare Information*. Proceedings of the 1996 Modeling, Simulation, and Virtual Prototyping Conference. American Society of Naval Engineers (ASNE).

Darken, C.J., & Darken, R.P. (1995). *Virtual Reality + Artificial Intelligence = Intelligent Environments: A Synergistic Approach to Engineering Design Support*. Proceedings of SPIE '96.

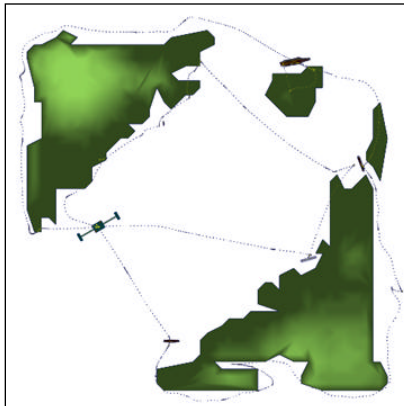
Darken, R.P. (1994). *Hands-Off Interaction With Menus in Virtual Spaces*. Proceedings of SPIE '94, Stereoscopic Displays and Virtual Reality Systems. Vol. 2177, 365-371.

Darken, R.P., & Sibert, J.L. (1993). *A Toolset for Navigation in Virtual Environments*. Proceedings of UIST '93. 157-165.

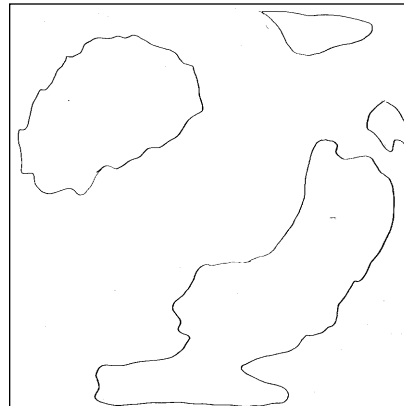
Apparatus for the navigation experiment



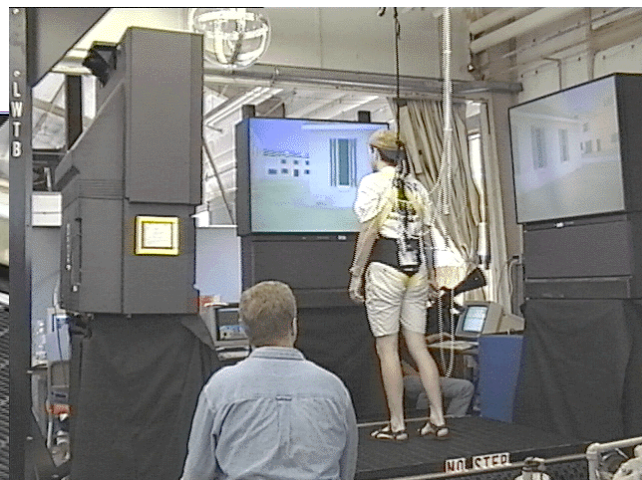
A typical environment in the experiment



A track map showing the movement of a subject



The map this subject drew after completing the experiment



**Evaluation of the
Omni-Directional Treadmill**